# CURRENT LITERATURE

## NOTES FOR STUDENTS

**Phenomena of parasitism.**—Two further contributions to a series of studies begun by BROWN[1] on the parasitism of *Botrytis cinerea* have appeared. In the first of these, BLACKMAN and WELSFORD[2] describe the microscopical details of the process of penetration of the cuticle by the germ tubes; in the second, BROWN[3] deals more specifically than in his former paper with the action on the cuticle of extracts and exudates of the germ tubes.

BLACKMAN and WELSFORD observed in the earliest stages of penetration a slight indentation of the outer epidermal wall as a result of the action of the germ tube, which is held fast to the cuticle by a mucilaginous sheath whose presence was made evident by means of a suspension of silver particles. The actual penetration of the cuticle is accomplished by a narrow peglike outgrowth from the tip of the germ tube. No swelling of the cuticle or of the subcuticular layers previous to penetration was observed, and in no case was an injury to the epidermal cells or subepidermal cells apparent before the breaking of the cuticle. Soon after the penetration of the epidermis, the cells of the palisade layer begin to disintegrate, and with the advance of the hypha the cells of the spongy parenchyma also are killed. The toxic action of the fungus extends considerably beyond the region actually invaded. After a portion of the leaf tissue had been killed, other hyphae were observed to penetrate through the stomata, probably as a result of the diffusion of food substances from the dead cells, for primary infection though a stomate was never seen.

From their observations the authors conclude that the cuticle is ruptured by mechanical pressure exerted by the germ tube and not by the solvent action of any substance secreted by it. They believe that the germ tube is enabled to exert the pressure necessary for the indentation of the cell wall and penetration of the cuticle by virtue of the gelatinuous sheath which holds the germ tube in place. It is not clear, however, how the germ tube is thus enabled to bring about an indentation of the cell wall over an area more extensive than that covered by the tip of the tube itself, as shown in some cases (notably

[1] Rev. BOT. GAZ. **61**:79. 1916.

[2] BLACKMAN, V. H., and WELSFORD, E. J., Studies in the physiology of parasitism. II. Infection by *Botrytis cinerea*. Ann. Botany **30**:389–398. *pl. 10. figs. 2.* 1916.

[3] BROWN, WM., Studies in the physiology of parasitism. III. On the relation between the infection drop and the underlying host tissue. Ann. Botany **30**:399–406. 1916.

fig. 8). It appears not improbable that these may be accidental depressions, for in many cases of actual penetration figured such indentations are not evident.

In the study of the action on the cuticle of extracts and exudates of germ tubes, BROWN found that when the extract of germ tubes was placed in considerable quantity on intact leaves and petals of *Viola*, *Petunia*, *Dahlia*, *Vicia Faba*, and *Begonia heraclaefolia*, no effect was produced; but in experiments with *Tropaeolum*, *Geranium*, *Rosa*, and *Fuchsia* a varying number of discolored spots appeared on the surfaces covered by the drops. The action in these cases was attributed to possible wounds in the cuticle. All the extracts were tested also on wounded leaves and petals, and in those cases in which no action was observed, the corresponding experiments on uninjured leaves and petals were rejected. Thus conclusions were drawn only from extracts known to be active.

When spores were sown in drops of liquid on the surface of leaves, the discoloration appeared first around the margin of the drops where the spores germinated earliest. When such drops, containing germinating spores, were displaced slightly on the leaf, the discoloration due to the action of the spores appeared within the area originally outlined by the drop and none in the new area occupied. Infection drops cleared of spores had no action on the most sensitive petals.

With reference to the possibility of the production of oxalic acid in sufficient quantity to cause the death of tissues under the uninjured cuticle, BROWN found that solutions of $n/40$ oxalic acid and of $n/20$ potassium oxalate placed on the leaves had no effect within a period of 12 hours, the time required for the germinating spores to produce discoloration. The maximum concentration in the infection drops, it was shown, could not exceed $n/800$.

These experiments seem to show quite clearly that cuticle-dissolving substances are not present in the extracts made from germ tubes of *Botrytis cinerea*, and that such substances, if they exist, do not diffuse into the surrounding medium to any considerable extent. The conclusion that chemical action is entirely excluded seems somewhat too sweeping, however, for there still remains the possibility of such action at the point of contact of the germ tube with the cuticle by substances which cannot be obtained in extracts in an active state. The possibility that oxalic acid occurs in sufficient quantities to injure cells through the cuticle seems to be definitely excluded.

The observation that the germ tubes of *Botrytis cinerea* exude no substances which are capable of diffusing through the cuticle and killing the cells below corroborates the histological study of BLACKMAN and WELSFORD, according to which the cells underlying the cuticle are not injured before the cuticle has been perforated. In this respect, the behavior of *Botrytis cinerea* differs from that of *Sclerotinia Libertiana*, in which DEBARY observed a killing of the host cells before penetration of the cuticle.—H. HASSELBRING.